REMARKS

Claims 1-3, 5-7, and 9 were rejected for anticipation in view of Marko. Claims 4 and 8 were rejected as unpatentable over Marko in view of Carlson. Applicant requests reconsideration. Applicant extends appreciation to the examiner for the thorough examination, and particularly the detailed claim analysis, as that will focus this case. However, it should be noted that that analysis repetitively used the term "pulses" in connection with the teachings of Marko, yet, Marko does not teach "pulses" in any regard with respect to lead and lag incrementation, but rather teaches the use of "transitions". Marko never discusses in any regard the use of pulses for lead and lag determination, yet the claim analysis is saturated with references to "pulses" taught by Marko, which are clearly not taught. This characterization of Marko's transitions as if the same of the applicant's pulses is an unfair characterization in an anticipation rejection, and suggests a bias towards forbidden hindsight reconstruction. Marko never taught the use of pulses for lead and lag incrementation. New claim 10 was added to recite that the baseband waveform signal as claimed has zero crossings from which pulses are generated. New claim 11 was added to recite that the baseband waveform signal that encodes a digital bit stream, is modulated using various modulation methods. Marko's system does not generate pulses, and does not generate pulses from zero crossings, nor generate pulses from zero crossings from baseband signals generated from conventional communication modulation methods. Claims 10 and 11 further

distinguish the present invention from Marko, and particularly so, as now newly claimed.

Marko does not anticipate the present invention, at least, because: 1) Marko uses a recovered data signal as the input and are not the baseband waveform encoding a data bit stream; 2) because Marko early and late increments are based upon transitions of the recovered data signal and not based on pulses generated from the baseband waveform; and 3) because the phase error in Marko is determined from transitions and not from pulses. The RX data, that is, the recovered data signal, in Marko, is not a wideband waveform encoding a digital bit stream, as it is the data stream itself. The early and late increments, in Marko, are based on recovered data transitions and recovered clock transitions, and not on wideband waveform transition pulses and adjusted timing pulses. The phase error is determined, in Marko, by differences between the recovered data signal and the recovered clock, and not on differences between wideband zero crossing transition pulses and adjusted timing pulses. Significant teachings, with underline emphasis added, of Marko, are here set forth in full, for convenience.

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"Briefly, the two phase lock loops 402, 404 are operatively coupled in parallel forming the nested phase lock loop circuit 400. The nested phase lock loop circuit 400 includes a narrow bandwidth PLL (2nd order or 1st order) which detects transitions and accumulates early/late transitions indicating phase errors in recovered data transitions 406 when compared to a recovered clock signal 410 (to be described later). Early and late transitions are accumulated and counted in an up/down counter 414, which are compared to a threshold. When a large enough number of errors (early/late transitions) have been accumulated, an instantaneous adjustment is made to the phase of a reference signal 422 generated from a clock 420, preferably a digital reference clock. The narrow bandwidth recovered clock signal 410 is thus produced, and is then used as the master clock signal for the wideband DPLL circuit 404, also referred to as wideband loop". (Col. 3 line 11-28)

"Referring now to FIG. 5 there is shown a prior art timing diagram showing recovered clock 502, preferably set to 72 kHz, recovered data 504, and center bit sampled data 506. The recovered data rate 504 is preferably set to 72 kbits (36 kHz). Recovered data transitions, which may contain significant jitter induced from the radio channel, are phase compared to the falling edge of the recovered clock signal 502. The transition is determined to be early or late with respect to the falling edge of the clock signal 502. In this case, bit 0 of recovered data signal 504 has a first rising transition after the falling edge 503 of the recovered clock 502 and thus occurs in a late window". (Col 5, lines 24-35)

"A description of the operation of PLL 900 begins with a RX data input signal 902 from the radio frequency receiver entering the narrowband loop. This RX data signal is preferably a 72 kbit/s hard limited data signal derived from a receiver demodulator (not shown). The RX data signal 902 is applied to transition detector 904, which samples incoming data on preferably 1/32 bit boundaries and detects whether or not a transition has occurred. The registered transitions are then applied to the phase detector 906 for phase comparison with a narrow bandwidth (narrow BW) recovered clock signal 938 of preferably 72 kHz. (Col 7. lines 26-35)

The RX data signal 902 is also directed to the wideband loop and routed to transition detector 948, which similar to transition detector 904, samples incoming data on 1/32 bit boundaries and detects whether or not a transition has occurred. The registered transitions are then applied to a phase detector 950 for phase comparison with a wide BW recovered clock signal 980. Phase detector 950 outputs the result of the phase comparison between the incoming data transition and the recovered clock on an early/late line 952 and also generates a detect signal 954 to indicate when the comparison is complete. The difference between the number of early or late transitions is accumulated in an early/late accumulator 956, which is preferably implemented with an up/down counter. A sign output 958 of the early/late accumulator signifies whether more early transitions or more late transitions have occurred during the accumulation period. The sign output 958 is directed to an increment/decrement (Inc/Dec) input of an up/down counter 970. A magnitude output 960, also generated from the

early/late accumulator 956, signifies how many more early transitions than late transitions, or vice versa, have occurred during the accumulation period. The magnitude output 960 is provided to a comparator 966 for comparison with a predetermined wide loop BW value 964, which is set by controller 962. When the magnitude 960 exceeds the wide loop BW value set by the controller 962, comparator output 968 pulses high, which adjusts up/down counter 970 in a direction set by the Inc/Dec input 958. This resets or clears early/late accumulator 956 so that early or late transition accumulation restarts with respect to the updated wide BW recovered clock phase. The predetermined wide loop BW value 964 set by the controller 962 is preferably less than 20, so that if the early transitions exceed the late transitions by 20, or the late transitions exceed the early transitions by 20, an adjustment is made to the Up/Down counter 970, and the early/late accumulator 956 is cleared.

Up/down counter 970 is designed to shift the phase of the narrow BW recovered clock by preferably a maximum of 15/32 of a bit. This is accomplished with a 5-bit adder 974 and an invert MSB block 978 coupled to the adder output 976. A 5-bit output 972 generated from the up/down counter 970 is set to a value of 16 during reset which, when added to the 5-bit programmable counter output (Div By Cntr) 936 from the narrow BW loop at adder 974, provides 5-bit adder output 976 with the MSB inverted with respect to the programmable counter output 936. Block 978 then re-inverts the MSB of adder output 976, which brings the wide BW recovered clock 980 in phase with the narrow BW recovered clock 938. When the up/down counter

970 is incremented from 16 to 17, the wide BW recovered clock 980 is phase shifted by 1/32 of a bit with respect to the narrow BW recovered clock 938. Counter 970 ranges from 1 to 31, which limits the maximum phase shift to .+-.15/32 of a bit. Adjustments to counter 970 align the rising edge of the 72 kHz wide BW recovered clock signal 980 to bit transitions in the 72 kbit data stream 902, which also aligns the falling edge of the recovered clock signal to the bit centers in the 72 kbit data stream. The wide BW recovered clock signal 980 is applied to inverter 982 to generate the wide center bit sample (WIDE.sub.-- CBS) signal 984 with rising edge aligned with the RX data 902 bit centers.

In summary, the wide bandwidth loop rapidly adjusts recovered clock phase to track fast timing fluctuations in the RX data signal 902 and to insure optimum center bit sampling, while guarding against bit slippage by constraining phase adjustment to .+-.15/32 of a bit maximum from the high stability narrow BW recovered clock". (Col 8 line 63 through Col 9 line 61.)

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As such, Marko teaches an input RX data recovered signal, teaches early and late increments based upon input RX data recovered signal transitions and recovered clock transitions, and teaches phase error determination based upon differences between transitions of the input RX data recovered signal and recovered clock. Marko's RX data recovered signal is just that, and as such, cannot possibly be a baseband signal waveform encoding that very same recovered data signal. The present invention teaches and claims an input baseband signal that encodes, but is not, a recovered data stream. Marko does not anticipate the present invention. Furthermore, Marko does not suggest the present invention.

The background of the present specification teaches "The baseband signal waveform is subject to channel noise leading to poorly generated timing pulses and hence poor bit timing resulting in poor data detection." (Background) " Noisy channels suffer from ambiguous bit timing transitions leading to jittering and inaccurate timing pulses." The background of the specification had already addressed various uses of random walk filtering. "Random walk filters have been used for decades in various applications. In the past, random walk filters have been applied to digital phase synchronization systems." (Background) This may apply to Marko. "TECHNICAL FIELD, This invention relates in general to communication devices, and more specifically to digital phase lock loops., BACKGROUND, Loss of synchronization during communications in a digital communication system such as a second generation cordless telephone (CT2) system creates unwanted problems to system

users. Loss of synchronization can be induced by selective multi-path fading, fiat fading, weak signals, as well as other well known communication phenomena." (Col 1 line 1) " Hence there is a need for an improved DPLL apparatus and method that maintains synchronization and reduces the occurrences of mutes in a system subjected to such problems as multi-path fading, weak signals, interference, and fiat fading." (Col 1 lines 63-66) It is, of course, counter-intuitive to apply a digital quantizing process having inherent errors by virtue of that quantization, that is, Marko's 1/32 bit boundaries transition detection, as compared to applicant's continuum signal of the baseband waveform having zero crossings providing more precise pulse detection without that quantization.

Marko's transitions and applicant's pulses solve different problems associated with different designs. Marko's first translates the baseband waveform signal into a recovered data signal having jittering associated with bit boundary quantization detection, into a non-jittering digital recovered signal not having any zero crossings. Marko uses the 1/32 bit period boundary quantization for determining time of transitions. This 1/32 bit period is a discrete sampling, whereas the pulse detection from a baseband signal having zero crossings has a continuum sampling of infinite precision, though subject to false triggering when the baseband signal is noisy about the zero crossings. Hence, the present invention compares baseband waveform signal zero crossing transition pulses with adjusted pulses, and in the event of false triggering, ignores double triggers or no triggers. Marko's 1/32

bit period transition time quantization can not be as precise as an analog continuum sampling through a zero crossing, and does not have the problem of generating and comparing good and false pulses.

Marko's design is fundamentally different from the present invention. Marko first digitizes the incoming baseband waveform signal into an RX data recovered signal square wave extending from only a zero level to only a high level. Then, Marko seeks to determine the phase error based on time differences between transitions of the RX data recovered signals and the recovered clock. The present invention does not convert the incoming baseband waveform signal into a like high and low digital recovered data signal prior to determining the phase errors. In Figure 1, the data detector actually receives the baseband waveform signal. The data detection is had by applying the adjusted pulses directly to the baseband waveform signal for only then generating the digital bit stream, whereas Marko's data detector applies recovered clock transitions to the RX recovered data signal to generate the data bit stream. The high-order architecture of Marko is thereby different in approach, and thereby, not only does not suggest the claimed combination, but also, teaches contrary to the present invention, and thus, Marko is strong evidence of nonobviousness.

Marko does not anticipate the present invention because 1) Marko uses a recovered data signal as the input and not the baseband waveform encoding a data bit stream; 2) because Marko early and late increments are based upon transitions of the recovered data signal and not based on pulses generated from the

baseband waveform; and 3) because the phase error in Marko is determined from transitions and not from pulses. Marko does not suggest the present invention, at least, because: 1) Marko teaches away form the present invention by firstly digitizing the baseband waveform into a recovered data signal in advance of data detection, which is completely contrary to applicant's data detection directly upon the baseband waveform signal encoding the digital bit stream using pulses generated from that baseband waveform, 2) because Marko's quantization of the modulated baseband waveform signals into the data recovered signals, which then used for data detection, and which injects jitter errors due to discrete 1/32 bit boundaries quantization, is counter-intuitive to the use of a continuum flowing through zero crossings of modulated baseband waveform signals. The combination of Marko and Carlson thereby becomes largely irrelevant respecting in these aspects. Applicant requests allowance of claims.

Respectfully Submitted

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